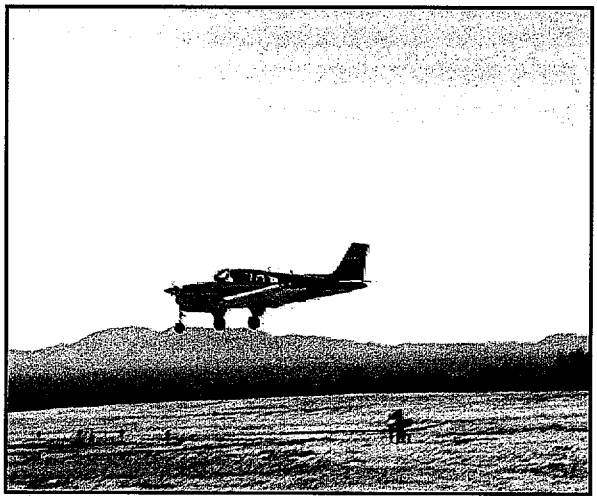
Chapter Two

AVIATION DEMAND FORECASTS

AVIATION DEMAND FORECASTS

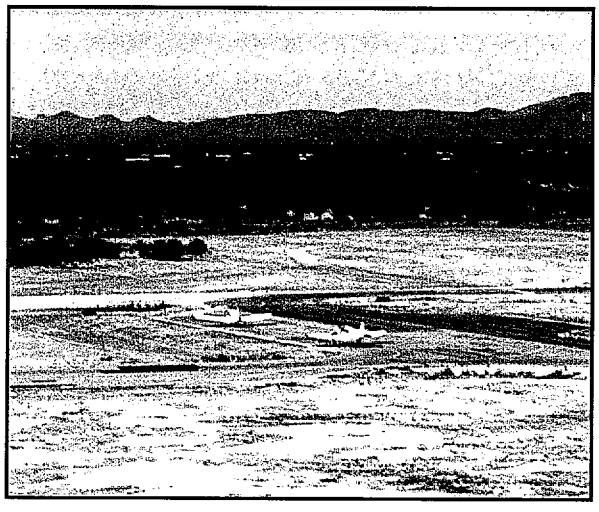


Facility planning must begin with a definition of the demand that may reasonably be expected to occur at the facility over a specific period of time. For Ryan Airfield, this involves forecasts of aviation activity indicators through the year 2020. In this master plan, forecasts of based aircraft, based aircraft fleet mix, and annual aircraft operations will serve as the basis for facility planning.

It is virtually impossible to predict with certainty year-to-year fluctuations of activity when looking twenty years into the future. Because aviation activity can be affected by many influences at the local, regional, and national level, it is important to remember that forecasts are to serve only as guidelines and planning must remain flexible enough to respond to unforeseen facility needs.

Recognizing this, it is intended to develop a master plan for Ryan Airfield that will be demand-based rather than time-based. As a result, the reasonable levels of activity potential that are derived from this forecasting effort will be related to the planning horizon levels rather than dates in time. These planning horizons will be established as levels of activity that will call for consideration of the implementation of the next step in the master plan program.

The following forecast analysis examines recent developments, historical information, and current aviation trends to provide an updated set of aviation demand projections for Ryan Airfield. The intent is to permit the Tucson Airport Authority to make the planning adjustments necessary to



ensure that the facility meets projected demands in an efficient and cost effective manner.

NATIONAL AVIATION TRENDS

Each year, the Federal Aviation Administration (FAA) publishes its national aviation forecast. Included in this publication are forecasts for air carriers, regional air carriers, general aviation, and military activity. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition when this chapter was prepared was ***FAA Aviation Forecasts - Fiscal Years 1998-2009***. The forecast uses the economic performance of the United Sates as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets.

For the U.S. aviation industry, the outlook for the next twelve years is for moderate economic growth, low to moderate inflation, and constant real fuel prices. Based on these assumptions, aviation activity by fiscal year 2009 is forecast to increase by 18.9 percent at combined FAA and contract towered airports and 24.6 percent at air route traffic control centers. The general aviation active fleet is projected to increase by 12.5 percent while general aviation hours flown are forecast to increase by 18.1 percent.

By most statistical measures, general aviation recorded its third consecutive year of growth. Following more than a decade of decline, the general aviation industry was revitalized with the passage of the General Aviation Revitalization Act in 1994 (federal legislation which limits the liability on general aviation aircraft to 18 years from the date of manufacture). This legislation sparked an interest to renew the manufacturing of general aviation aircraft due to the reduction in product liability and a renewed optimism for the industry. The high cost of product liability insurance was a major factor in the decisions by many American aircraft manufacturers to slow or discontinue the production of general aviation aircraft.

According to the General Aviation Manufacturers Association (GAMA), aircraft shipments and billings grew for the third consecutive year in 1997, following fourteen years of annual declines. In 1997, general aviation aircraft manufacturers shipped a total of 1,569 aircraft totaling $4.7 billion. For 1997, aircraft shipments were up 38.8 percent and billings up 49.5 percent over 1996. In 1996, general aviation aircraft manufacturers shipped a total of 1,130 aircraft totaling $3.1 billion.

For 1997, piston engine aircraft shipments were up 64.2 percent and turbine engine aircraft shipments up 10.2 percent. Single-engine piston aircraft recorded the single largest gain, growing 70.8 percent in 1997 while turbofan aircraft shipments increased 44.4 percent. Multi-engine piston aircraft shipments grew 14.3 percent.

Only turboprop aircraft registered a decline in shipments in 1997 (18.3 percent).

Despite a small decline in the number of active pilots, student pilot starts were up 1.3 percent in 1997, following a 6.3 percent decline in 1996. These student pilots are the future of general aviation and are one of the key factors impacting the future direction of the general aviation industry. This increase combined with the increases in piston-powered aircraft shipments and aircraft production are a signal that many of the industry initiated programs to revitalize general aviation may be taking hold.

For 1998, GAMA has indicated that general aviation billings in the first quarter of 1998 were the highest in history. Billings have increased from $886 million for the first quarter of 1997 to $1.1 billion for the first quarter of 1998, equating to a 24.5 percent increase over the previous year. GAMA also indicates that aircraft shipments for the first quarter of 1998 increased by 92.4 percent over the same period in 1997. Aircraft shipments rose to 456, up from 237 in 1997, and jet deliveries reached 82 units, up 30.2 percent over 1997 first quarter shipments.

The most notable trend in general aviation is the continued strong use of general aviation aircraft for business and corporate uses. According to the FAA, general aviation operations and general aviation aircraft handled at enroute traffic control centers increased for the sixth consecutive year, signifying the continued growth in the use of the more sophisticated general aviation aircraft. In 1996 (the latest year of recorded data), the number of hours flown by the combined use categories of business and corporate flying represented 22.5 percent of total general aviation activity. In 1990, the number of hours flown by the combined use categories of business and corporate flying represented 21.8 percent of total general aviation activity.

Manufacturer and industry programs and initiatives continue to revitalize the general aviation industry. The newest program "GA Team 2000" has the goal of 100,000 annual student pilot starts by the year 2000. The New Piper Aircraft company has created Piper Financial Services (PFS) to offer competitive interest rates and/or leasing of Piper aircraft.

The most striking industry trend is the continued growth in fractional ownership programs. Fractional ownership programs allow businesses and individuals to purchase an interest in an aircraft and pay for only the time that they use the aircraft. This has allowed many businesses and individuals, who might not otherwise, to own and use general aviation aircraft for business and corporate uses. Aircraft manufacturers Raytheon, Bombardier, and Dassault Falcon Jets have all established fractional ownership programs. Industry leader Executive Jet Aviation has expanded their program to include Boeing Business Jets and Gulfstream Aircraft.

Exhibit 2A depicts the FAA forecast for active general aviation aircraft in the United States. The FAA forecasts general aviation active aircraft to increase at an average annual rate of

1.0 percent over the next 12 years, increasing from 187,312 in 1996 to 212,960 in 2009. Over the forecast period, the active fleet is expected to increase by almost 2,000 annually (considering approximately 2,000 annual retirements of older piston aircraft and new aircraft production at 4,000 annually). Turbine-powered aircraft are projected to grow faster than all other segments of the national fleet and grow 2.2 percent annually through the year 2008. This includes the number of turboprop aircraft growing from 5,309 in 1996 to 6,482 in 2009 and the number of turbojet aircraft increasing from 4,287 in 1996 to 6,228 in 2009. Amateur built aircraft are projected to increase at an average annual rate of 1.1 percent over the next twelve years, increasing from 16,198 in 1996 to 18,622 in 2008.

FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships are tested to establish statistical logic and rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and their assessment of the local situation, is important in the final determination of the preferred forecast.

It is important to note that one should not assume a high level of confidence in forecasts that extend beyond five years. Facility and financial planning usually require at least a ten-year preview, since it often takes more than five years to complete a major facility development program. However, it is important to use forecasts which do not overestimate revenue-generating capabilities or understate demand for facilities needed to meet public (user) needs.

A wide range of factors are known to influence the aviation industry and can have significant impacts on the extent and nature of air service provided in both the local and national market. Technological advances in aviation have historically altered, and will continue to change, the growth rates in aviation demand over time. The most obvious example is the impact of jet aircraft on the aviation industry, which resulted in a growth rate that far exceeded expectations. Such changes are difficult, if not impossible to predict, and there is simply no mathematical way to estimate their impacts. Using a broad spectrum of local, regional and national socioeconomic and aviation information, and analyzing the most current aviation trends, forecasts are presented in the following sections.

To determine the types and sizes of facilities that should be planned to accommodate general aviation activity, certain elements of this activity must be forecast. Indicators of general aviation demand include:

- Based aircraft
- Based aircraft fleet mix
- General aviation operations
- Peak operation activity
- Annual instrument operations

The remainder of this chapter will examine historical trends with regard to

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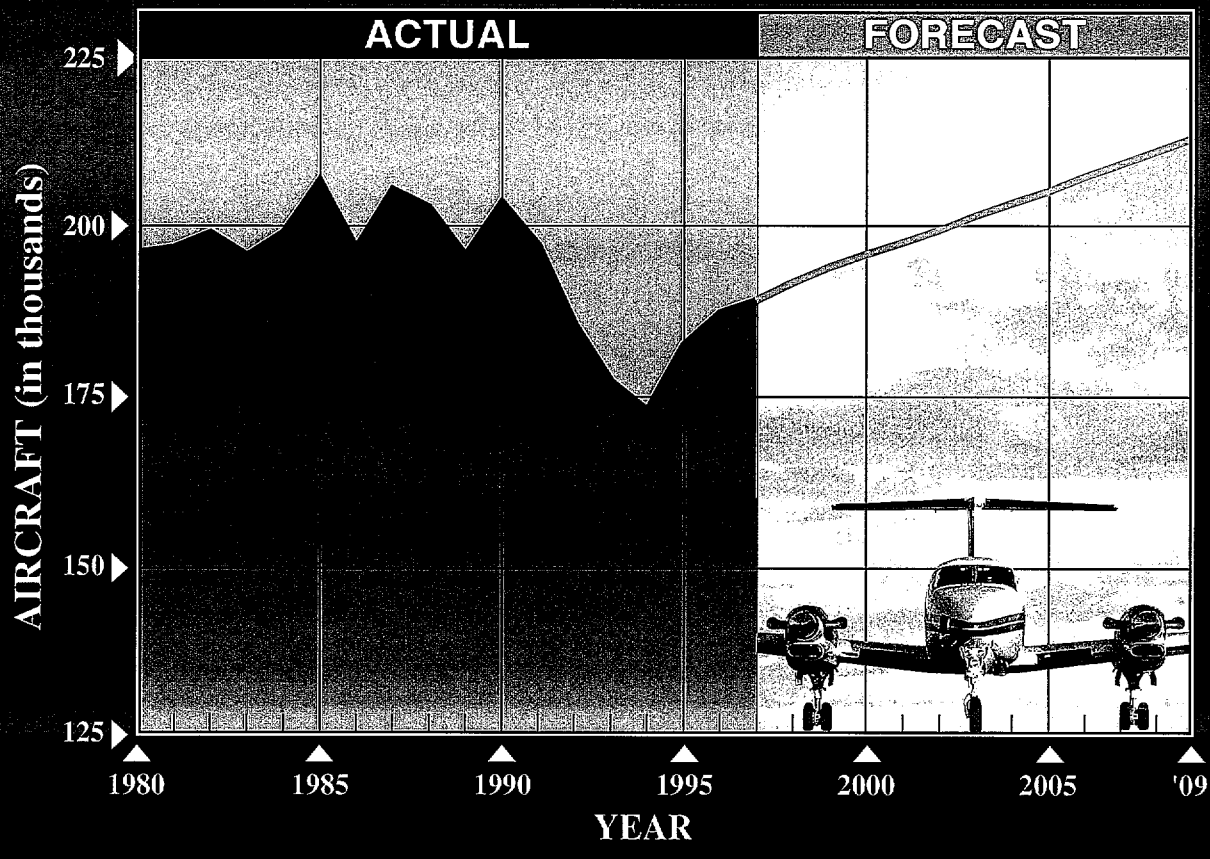
ACTIVE GENERAL AVIATION AIRCRAFT



U.S. ACTIVE GENERAL AVIATION AIRCRAFT (in thousands)

As of January 1	FIXED WING				ROTORCRAFT				
	PISTON		TURBINE						
	Single Engine	Multi-Engine	Turboprop	Turbojet	Piston	Turbine	Experimental	Other	Total
1997	136.7	15.8	5.3	4.4	2.4	4.0	16.4	4.2	189.3
2000	141.2	16.0	5.5	4.9	2.3	4.2	17.1	4.3	195.6
2003	145.3	16.2	5.8	5.4	2.2	4.4	17.7	4.4	201.4
2006	149.5	16.5	6.1	5.8	2.2	4.5	18.1	4.5	207.2
2009	153.7	16.6	6.5	6.2	2.1	4.6	18.6	4.6	212.9

Source: FAA Aviation Forecasts, Fiscal Years 1998-2009.

Notes: Detail may not add to total because of independent rounding. An active aircraft must have a current registration and it must have been flown at least one hour during the previous calendar year.

TUCSON AIRPORT AUTHORITY

Exhibit 2A
U.S. ACTIVE GENERAL AVIATION AIRCRAFT FORECASTS

these areas of general aviation and project future demand for these segments of general aviation activity at the airport.

BASED AIRCRAFT

The number of aircraft based at an airport is, to some degree, dependent upon the nature and magnitude of aircraft ownership in the local service area. In addition, Ryan Airfield is one of several airports serving the general aviation needs of the Tucson metropolitan area. Therefore, the process of developing forecasts of based aircraft for Ryan Airfield begins with a review of historical aircraft registrations in the area.

REGISTERED AIRCRAFT FORECASTS

Historical records of aircraft ownership in the Tucson MSA (Pima County) were obtained from the **Census of U.S. Civil Aircraft** and are presented on **Table 2A**. Since 1985, registered general aviation aircraft in the county have grown from 922 to 1,046 for an annual average growth rate of just under one percent. Growth fluctuated in the late 1980's and early 1990's, but has been relatively strong in recent years.

The Pima Association of Governments **Regional Aviation System Plan Update** (PAG RASP), dated February 1995, included a forecast of registered aircraft in the county. These projections are summarized in **Table 2B.** The year 1993 was the base year for this previous forecast effort. Projections were made based upon the average rate of growth since 1984, Pima County's share of FAA projections of active aircraft in the Western Region, and a projection based upon registered aircraft per capita. The selected forecast used the aircraft per capita methodology. In the year 2000, registered aircraft were projected to be 1,057. Based upon 1998 totals of 1,046 aircraft, actual registered aircraft are growing slightly faster than projected. As a result, the forecasts are revisited below.

Table 2A also compares registered aircraft to active general aviation aircraft in the United States. Unfortunately, the FAA changed its method of compiling active aircraft this past year, and historic data was corrected only back to 1992. Over that period of time, however, the Pima County share of the U.S. market of general aviation aircraft has fluctuated around 0.55 percent. **Table 2A** presents a projection of registered aircraft in Pima County based upon maintaining this percentage as a constant market share in the future.

A time-series extrapolation of registered aircraft was developed based upon the period of 1985 to 1998. The correlation coefficient, or r-value, was determined to be 0.892. [The correlation coefficient (Pearson's "r") measures the association between changes in the dependent variable (registered aircraft) and the independent variable(s). An r-value greater than 0.90 indicates generally good predictive reliability. A lower value may be used with the understanding that the predictive reliability is lower.] **Table 2C** presents the resulting projection for comparison

with the Regional System Plan forecast and the market share projection. The time-series extrapolation results in a forecast that is lowest of these three projections.

TABLE 2A
Registered Aircraft and Independent Variables
Tucson MSA

				Tucson MSA	
Year	Registered GA Aircraft (Tucson MSA)[1]	U.S. Active Aircraft[2]	% of U.S. Market	Population[3]	PCPI (1992 $)[4]
1985	922	N/A	N/A	611,471	16,720
1986	878	N/A	N/A	630,560	17,146
1987	940	N/A	N/A	646,054	17,057
1988	919	N/A	N/A	657,431	16,919
1989	949	N/A	N/A	658,216	17,085
1990	918	N/A	N/A	662,954	16,867
1991	909	N/A	N/A	676,291	16,904
1992	932	185,650	0.502	691,178	17,005
1993	973	177,120	0.549	709,734	17,306
1994	995	172,935	0.580	732,936	17,841
1995	1,015	182,605	0.556	758,585	18,125
1996	1,035	187,312	0.553	780,750	18,609
1997	1,035	189,328	0.547	799,834	18,917
1998	1,046	191,562	0.547	817,851	19,247
PROJECTED					
2005	1,129	205,274	0.550	943,795	21,507
2010	1,182	214,800	0.550	1,031,623	23,149
2020	1,288	234,000	0.550	1,206,244	26,264

N/A Not available due to change in methods for counting active aircraft.

Source:
[1] U.S. Census of Civil Aircraft; FAA
[2] FAA Aviation Forecasts, 1998-2009 (1997 estimated and 1998 forecast)
[3] City of Tucson Planning Department
[4] Woods & Poole Economic and Demographic Forecasts, 1998

TABLE 2B
1995 Regional Aviation System Plan
Registered Aircraft Projections
Pima County

	1992	2000	2005	2020
Market Share Approach	932	781	805	867
Growth Rate Methodology	932	1,023	1,085	1,292
Per Capita Methodology	932	1,057	1,126	1,327

Source: Pima Association of Governments Regional Aviation System Plan Update, February 1995

Next, further regression analyses were conducted to evaluate potential statistical fits between registered aircraft and a pair of independent, socioeconomic variables often linked to general aviation demand -- population and per capita income. **Table 2A** includes the historical and projected population of the Tucson MSA as well as the MSA per capita income in 1992 dollars.

Utilizing the period of 1985-1998 in the regression analysis, both independent variables provided good correlations with population the highest at 0.936. A multiple regression combining population and per capita income provided a slightly higher correlation at 0.942. The r-values and resulting projections are included in **Table 2C** for comparison. The multiple regression analysis provided a projection between the projections of the single regressions. All three resulted in higher projections than the market share, the time-series and the previous forecast from the PAG RASP.

TABLE 2C
Registered Aircraft Forecasts

	r	1998	2005	2010	2020
Time-Series (1985-1998)	.892	1,046	1,119	1,177	1,293
Market Share U.S. Active Aircraft		1,046	1,129	1,182	1,288
Regression Analysis					
vs. MSA Population	.936	1,046	1,149	1,218	1,353
vs. MSA PCPI	.921	1,046	1,197	1,295	1,481
vs. MSA & PCPI	.942	1,046	1,171	1,252	1,409
vs. MSA, PCPI, U.S. Active Aircraft*	**.989**	**1,046**	**1,152**	**1,218**	**1,357**
Regional System Plan		1,026	1,090	N/A	1,360

* Selected Forecast

Although a regression analysis with U.S. active general aviation aircraft did not provide a good correlation (0.469), a multiple regression was still performed combining the national industry variable with the local variables for the period of 1992-1998. The result was the highest correlation (0.989) and a projection very similar to that of the regression with population. These two projections are near the mid-range of the various projections. They also provided the highest correlations of single and multiple regressions. Therefore, the multiple regression was selected as the preferred forecast because it took into account three variables that will be critical to the growth of general aviation in the Tucson area. **Exhibit 2B** graphically depicts the selected forecast in comparison with several of the other projections.

BASED AIRCRAFT FORECAST

Records on historical data of based aircraft at Ryan Airfield has been sporadic in recent years. **Table 2D** presents the available history since 1985. The PAG Regional Aviation System Plan was the source for based aircraft up to 1993. The SANS was the source for the 1995 based aircraft total. The most current FAA Form 5010 indicated that there were 250 based aircraft in 1997. A based aircraft inventory was developed for this Master Plan that includes each based aircraft by N-number and type. The inventory is included as **Appendix B**. This inventory indicated there were 234 aircraft based at Ryan Airfield in 1998.

Table 2D compares the based aircraft at Ryan Airfield as a percentage of the general aviation aircraft registered in Pima County from 1985 to 1998. With the exception of the reported 250 aircraft in 1996, the based aircraft has generally fluctuated between 20 and 23 percent of the registered general aviation aircraft. This is an average of 22 percent of the registered aircraft in the county.

Future growth at Ryan Airfield will be somewhat dependent upon growth areas of the Tucson metropolitan area, as well as the services and capacities offered at the other airports in the region.

The major growth in the region is occurring on the north side of the metropolitan area. Avra Valley Airport is located in the path of this north side development. Growth is still expected on the southwest side, although probably not quite as dramatic. The basing priorities will also be affected by availability of hangars, instrument approaches, and air traffic control as well as the type and quality of services available.

At Tucson International Airport (TIA), a recently completed General Aviation Strategic Plan is being implemented. This plan is intended to primarily address the needs of current tenants and major corporate users who demand proximity to the central business district. Major commercial service and military activity at TIA, however, will continue to make Ryan Airfield an attractive alternative location for general aviation users. Forecasts for TIA indicate that it will continue to maintain its share of registered aircraft in the MSA.

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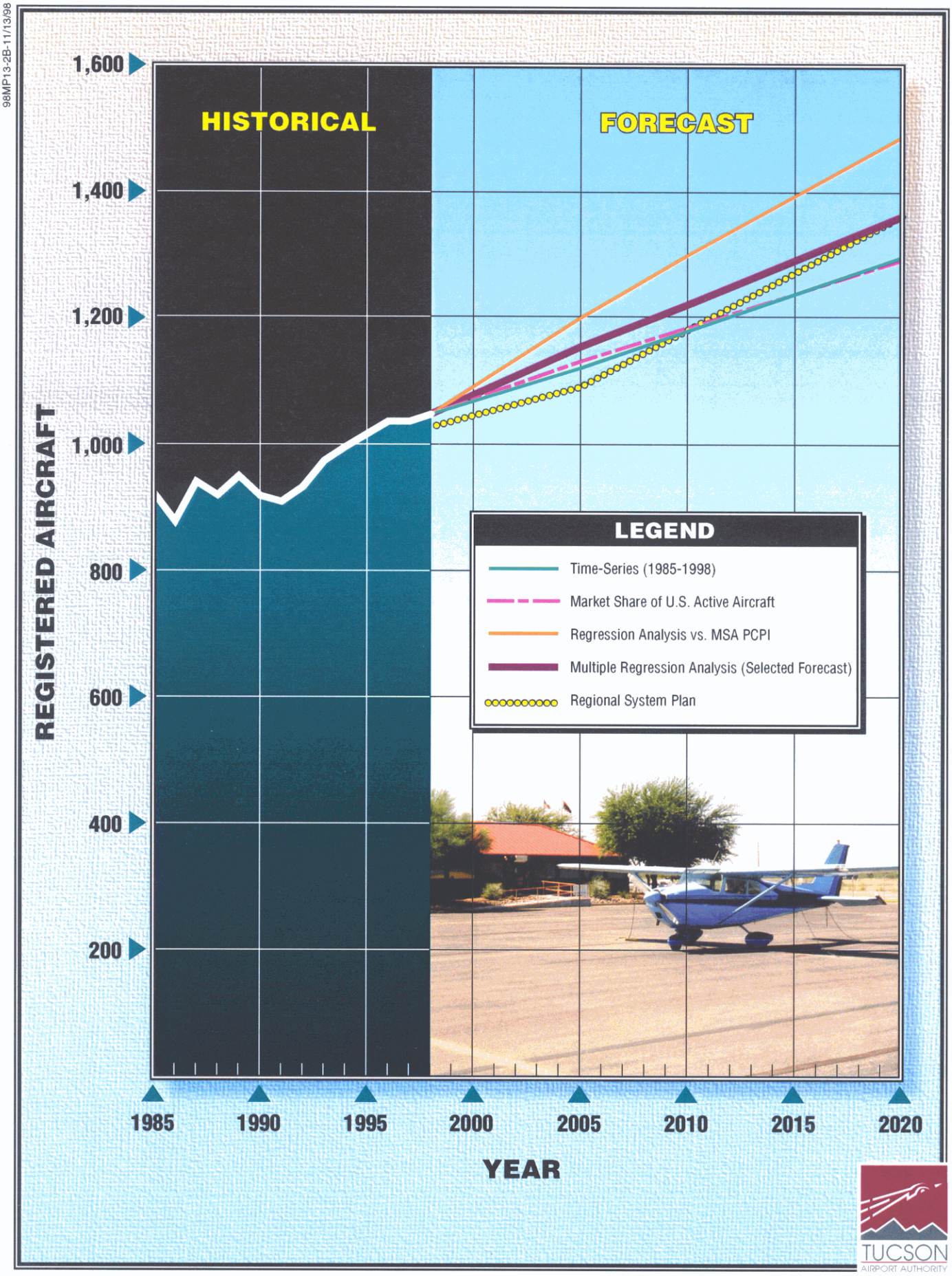

TUCSON AIRPORT AUTHORITY

Exhibit 2B
TUCSON MSA REGISTERED
AIRCRAFT FORECAST

TABLE 2D
Based Aircraft Forecast
Ryan Airfield

Year	Pima County Registered	Based Aircraft	Percent of Registered
1985	922	185	20.1
1986	878	187	21.2
1987	940	210	22.3
1988	919	213	23.2
1989	949	212	22.3
1990	918	210	22.9
1991	909	208	22.9
1992	932	206	22.1
1993	973	205	21.1
1996	1,035	250	24.2
1998	1,046	234	22.4
FORECAST			
2005	1,152	265	23.0
2010	1,218	292	24.0
2020	1,357	353	26.0

Ryan Airfield can also be expected to at least maintain its share of the market. It offers advantages for training and business use such as the air traffic control tower and the precision instrument approach. For planning purposes, a modest increase in the market share has been projected. **Table 2D** reflects this forecast of based aircraft for Ryan Airfield. **Exhibit 2C** compares these forecasts with those from the previous master plan, and the PAG RASP. The forecast is significantly lower than the previous master plan and higher than the PAG RASP over the long range.

BASED AIRCRAFT FLEET MIX

Knowing the aircraft fleet mix expected to utilize the airport is necessary to properly plan facilities that will best serve the level of activity and type of activities occurring at the airport. The existing based aircraft fleet mix is comprised primarily of single-engine piston aircraft, but also includes 15 multi-engine piston aircraft, and two rotorcraft. Ryan Airfield's has historically had a fleet mix with a high percentage of single-engine aircraft. While nationally, the general aviation fleet mix is around 80 percent single-engine aircraft, at Ryan Airfield they comprise over 90 percent of the fleet.

To date, most of the turbine aircraft have selected to base at Tucson International Airport. This is primarily due to two factors: the proximity of TIA to the central business district and the lack of jet fuel at Ryan Airfield. The fleet projections were prepared assuming that jet fuel could be provided at Ryan Airfield in the future if demand warranted. **Table 2E** outlines the projected fleet mix. The national trend is towards a larger percentage of sophisticated aircraft and helicopters in the fleet mix. Growth within each category at the airport has been determined by comparison with national projections, which reflect current aircraft in production.

AIRCRAFT OPERATIONS

Aircraft operations are classified by air traffic control towers as either local and itinerant. A local operation is a take-off or landing performed by an aircraft that operates within site of the airport, or which executes simulated approaches or touch-and-go operations at the airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Generally, local operations are characterized by training operations. Typically, itinerant operations increase with business and industrial use since business aircraft are used primarily to carry people from one location to another.

TABLE 2E
Based Aircraft Fleet Mix
Ryan Airfield

		Piston		Turbine		
Year	**Total**	**Single Engine**	**Multi-Engine**	**Turboprop**	**Jet**	**Rotorcraft**
ACTUAL						
1998	234	214	18	0	0	2
FORECAST						
2005	265	238	20	3	1	3
2010	292	258	22	5	3	4
2020	353	308	26	9	5	5

Ryan Airfield operations are comprised of general aviation, a few air taxi, and military operations. For the purposes of this master plan, the air taxi operations have been incorporated into the general aviation operations. The following subsections discuss the operations forecasts.

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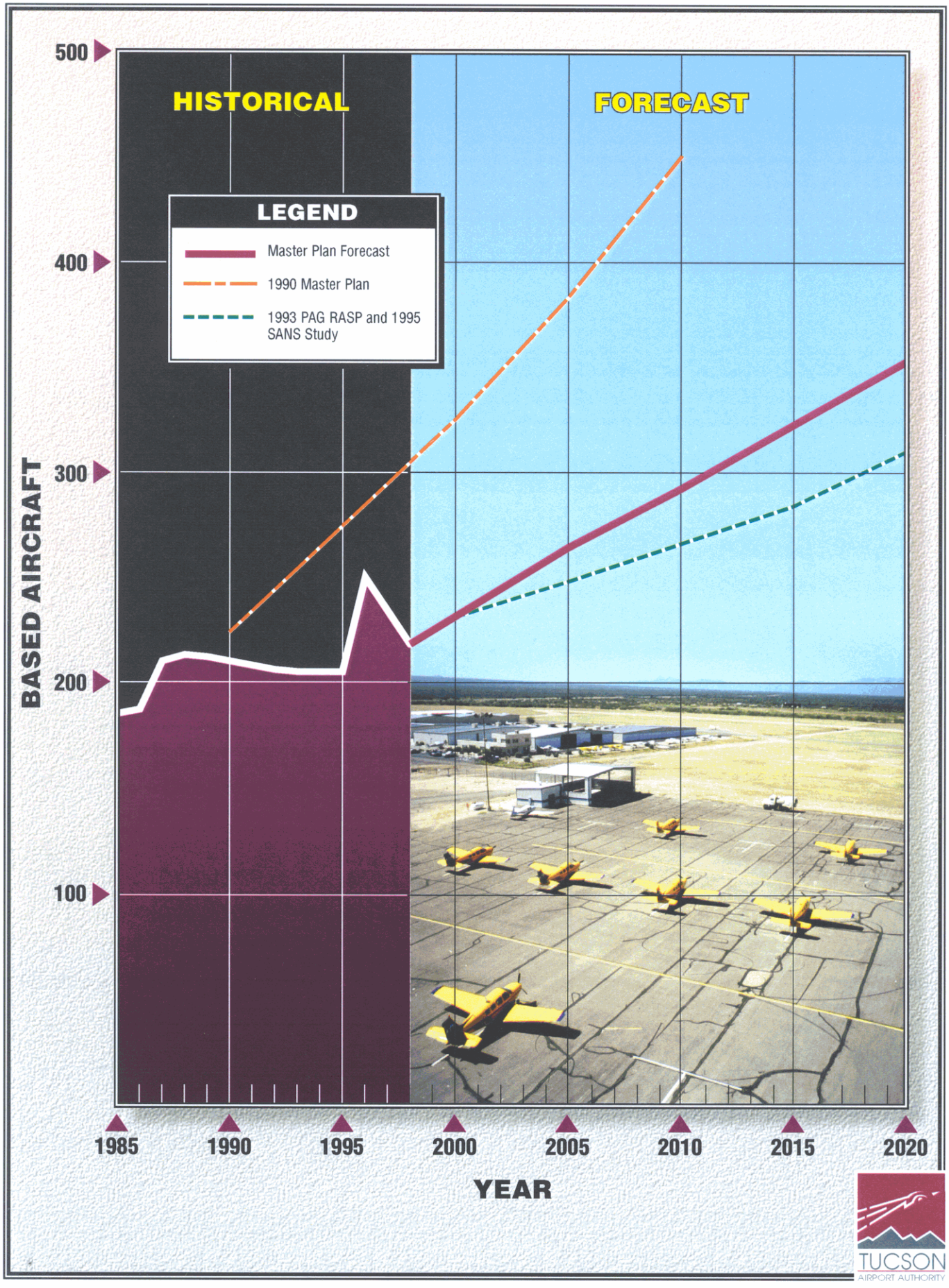

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Exhibit 2C
BASED AIRCRAFT FORECAST

GENERAL AVIATION OPERATIONS

Table 2F and **Exhibit 2D** depict annual general aviation operations as counted by the unicom and the air traffic control tower at Ryan Airfield since 1987. It should be noted that these figures include only those operations that occur when the tower is open. It is estimated that approximately four percent of the airport's operations occur when the tower is closed. For facility planning purposes, the tower count is an adequate benchmark of operations. Activity growth is readily compared to this actual count. Therefore the forecast presented here will be based upon the actual tower counts. For preparation of aircraft noise contours, however, the count and the forecasts presented here will need to be adjusted to include nighttime operations.

General aviation operation have actually been exceeding the 1990 Master Plan forecasts until the last two years when activity has slowed. Aircraft operations per based aircraft were examine separately for itinerant and local operations on **Table 2F**.

Excluding the high (1997) and low (1987) years, itinerant operations per based aircraft have fluctuated between 180 and 212. FAA Aviation Forecasts 1998-2009 projects itinerant general aviation operations at towered airports nationwide to grow at about 1.4 percent per year through 2005 then continue to grow at approximately 1.0 percent per year through 2020. This growth would suggest that the itinerant operations per based aircraft will also increase slowly over time. **Table 2F** presents a forecast of general aviation operations based upon this growth.

Local operations per based aircraft have experienced some definite increase since 1987. This is indicative of the increases in training activity that have occurred at Ryan Airfield since the 1990 Master Plan. After a peak of 477 operations per based aircraft in 1993, the ratio is still at 453 in 1998. FAA forecast of local operations at towered airports nationwide calls for a slightly slower growth than itinerant operations. Local operations nationwide are expected to increase by 1.1 percent per year through 2005, then slow to approximately 0.8 percent annually through 2020. The local operation forecast in **Table 2F** reflects a slight growth in operations per based aircraft over the planning period.

Over the planning period, itinerant operations can be expected to grow at a slightly faster rate than local operations. The itinerant percentage of total operations can be expected to grow from 32 to 35 percent.

MILITARY OPERATIONS

Military operations have historically been a small part of the activity at Ryan Airfield since there are no military units based at the airport. Due to the proximity to Davis-Mothan AFB and as well as the presence of several military operations areas (MOA's), military activity at Ryan Airfield has fluctuated with various missions. The highest military activity occurred in 1988 with 3,590 operations. 1998 should be the low year at just over 1,000 operations.

TABLE 2F
General Aviation Operations Forecast
Ryan Airfield

Year	Total Operations	Itinerant Operations	Local Operations	Based Aircraft	Itinerant Ops/BA	Local Ops/BA
1987	107,475	33,186	74,289	210	158	354
1988	124,430	42,087	82,343	213	198	387
1989	121,210	39,954	81,256	212	188	383
1990	135,702	44,610	91,092	210	212	434
1991	126,905	37,539	89,366	208	180	430
1992	144,249	38,396	105,853	206	186	514
1993	137,367	39,551	97,816	205	193	477
1994	155,000	50,400	104,620	N/A	N/A	N/A
1995	173,558	66,549	107,009	N/A	N/A	N/A
1996	175,635	60,746	111,844	250	243	447
1997	164,210	55,753	108,457	N/A	N/A	N/A
1998[1]	155,000	49,000	106,000	234	209	453
FORECAST						
2005	182,000	59,000	123,000	265	223	465
2010	206,000	69,000	137,000	292	235	470
2020	259,000	90,000	169,000	353	255	480

[1] Estimated based upon 10 months of operations
Source: Tucson Airport Authority Records

Since 1987 military activity has averaged approximately 2,000 annually. For planning purposes, this activity level is projected for the future, with operations split equally between itinerant and local. **Table 2G** presents the historic and forecast military operations.

PEAKING CHARACTERISTICS

Many airport facility needs are related to the levels of activity during peak periods. The periods used in developing facility requirements for this study are as follows:

- **Peak Month** - The calendar month when peak aircraft operations occur.
- **Design Day** - The average day in the peak month. This indicator is easily derived by dividing the peak month operations by the number of days in a month.
- **Busy Day** - The busy day of a typical week in the peak month.
- **Design Hour** - The peak hour within the design day.

It is important to note that only the peak month is an absolute peak within

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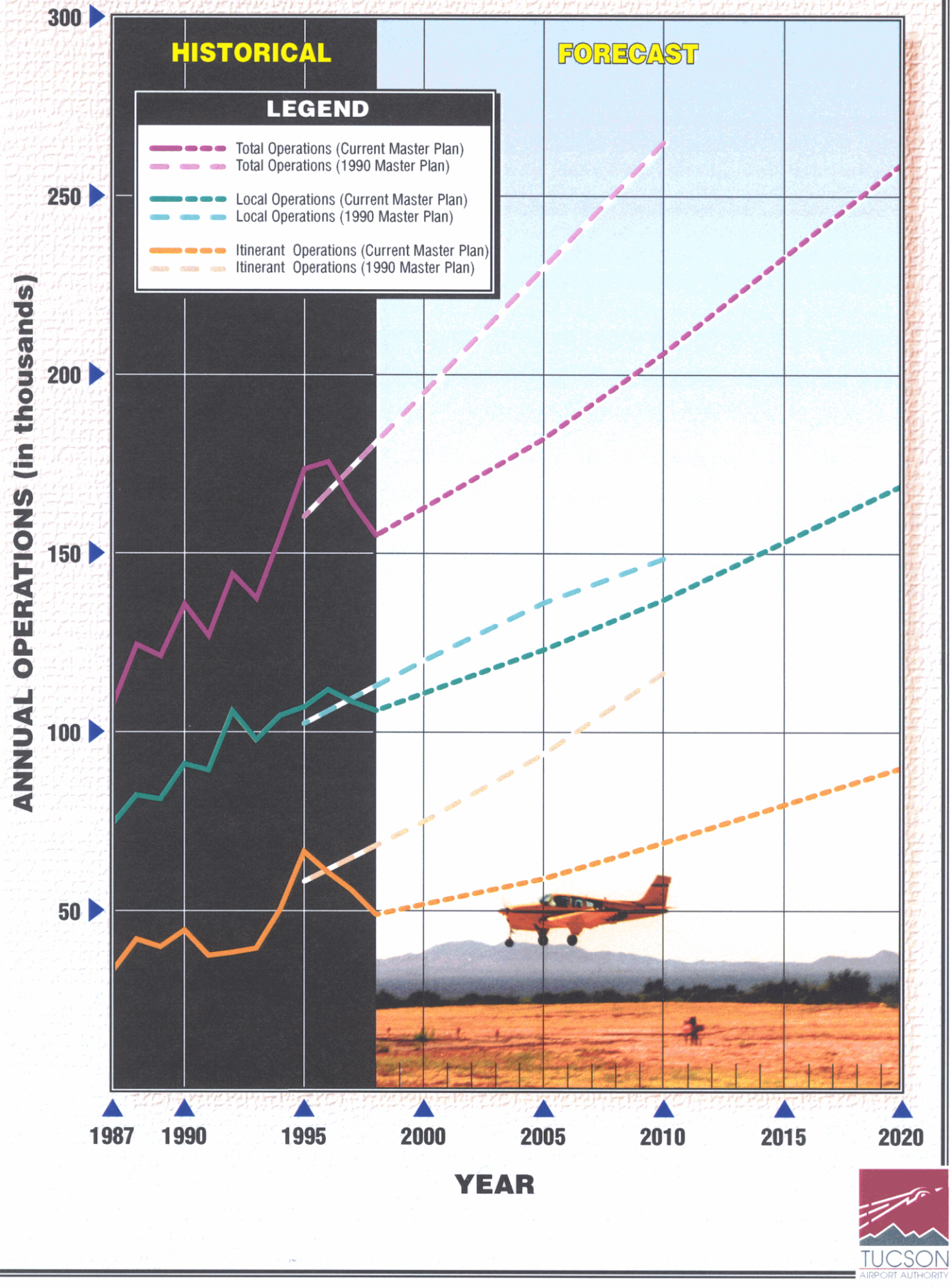

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Exhibit 2D
GENERAL AVIATION
OPERATIONS FORECAST

a given year. All other peak periods will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without overbuilding or being too restrictive.

TABLE 2G
Military Operations
Ryan Airfield

Year	Total Operations	Itinerant Operations	Local Operations
1987	1,199	441	758
1988	3,590	348	3,242
1989	2,887	57	2,830
1990	1,258	90	1,168
1991	1,405	146	1,259
1992	1,567	276	1,291
1993	1,322	100	1,222
1994	3,278	1,510	1,768
1995	3,523	1,874	1,649
1996	3,045	1,591	1,454
1997	1,771	999	772
1998	1,064	615	449
FORECAST			
2005	2,000	1,000	1,000
2010	2,000	1,000	1,000
2020	2,000	1,000	1,000

Actual tower counts were reviewed to determine the existing peak periods. Over the past several years, the peak month at Ryan Airfield has typically been May, which averages 10.0 percent of the annual operations. The peak month percentage was projected to remain at 10 percent throughout the planning period. The design day is then calculated by dividing the peak month activity by 31. The design day is used in airfield capacity calculations.

The busy day provides information for use in determining aircraft parking apron requirements. Daily data provided by the Ryan Tower was used to determine a busy day peaking factor. During the peak month, the busy day averages nearly 19 percent of a week's operations. This equates to a busy day approximately 30 percent higher than the average day.

Using ATCT records for May of 1998, the design hour was calculated to average 15 percent of the design day operations. As operations increase, this percentage is expected to decline slightly. To forecast future peak hour operations, this percentage was applied to the projected design day operations.

Table 2H summarizes the peak operations forecasts. It also includes separate peaks itinerant general aviation operations.

ANNUAL INSTRUMENT APPROACHES

Forecasts of annual instrument approaches (AIA's) provide guidance in determining an airport's requirements for navigational aid facilities. An instrument approach is defined by the FAA as "an approach to an airport with the intent to land by an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude".

Like the rest of the Tucson area, Ryan Airfield enjoys very minimal instrument weather. These ideal weather conditions are part of the reason why Ryan Airfield is a popular airport for pilot training. Subsequently Ryan Airfield seldom experiences actual instrument approaches. As a major training facility, however, there are many instrument training operations. While 1998 instrument operations are down, the previous three years instrument operations averaged 8.0 percent of local operations.

TABLE 2H
Peak Operations Forecast
Ryan Airfield

Year	2005	2010	2020
TOTAL OPERATIONS			
Annual	156,000	184,000	208,000	261,000
Peak Month	15,455	18,400	20,800	26,100
Design Day	499	587	671	842
Busy Day	664	763	872	1,095
Design Hour	75	83	92	109
GENERAL AVIATION ITINERANT OPERATIONS			
Annual	49,000	59,000	69,000	90,000
Peak Month	4,487	5,900	6,900	9,000
Design Day	145	190	223	290
Busy Day	193	253	297	386
Design Hour	22	27	31	38

Ryan Airfield can expect to remain as a major flight training facility in the future. While instrument operations may fluctuate from time to time due to the type of training, the availability of the instrument landing system is invaluable to the training role that the airport performs. For planning purposes, instrument operations were projected to continue at approximately eight percent of the local operations. These projections are presented on **Table 2J**.

TABLE 2J
Instrument Operations
Ryan Airfield

	1998	2005	2010	2020
Local Operations	49,000	59,000	69,000	170,000
Instrument Operations	1,250	9,900	11,000	13,600

SUMMARY

This chapter has outlined the various aviation demand levels anticipated over the planning period. In summary, general aviation activity at Ryan Airfield has shown strong growth. This growth, however has not matched the forecasts of the previous 1990 Master Plan. The airport still has good growth potential for both based aircraft and general aviation operations, due to a growing local economy and population.

Table 2K provides a summary of the aviation activity planning horizons for Ryan Airfield. Activity for 1998 is included in the table as a baseline reference. In subsequent chapters, these forecasts will be converted to planning horizons milestones to emphasize the master plan will be developed according to a demand-based schedule rather than a time-based one.

The next step in the master plan will be assess the capacity of existing facilities to accommodate forecast demand and determine which facilities will need to be improved to meet these demands. This will be examined in the next chapter -- **Chapter 3, Facility Requirements**.

TABLE 2K
Forecasts Summary
Ryan Airfield

	1998	2005	2010	2020
ANNUAL OPERATIONS				
Itinerant Operations				
General Aviation	49,000	59,000	69,000	90,000
Military	615	1,000	1,000	1,000
Local Operations				
General Aviation	106,000	123,000	137,000	169,000
Military	449	1,000	1,000	1,000
Total Operations	156,064	184,000	208,000	261,000
BASED AIRCRAFT				
Single Engine Piston	214	238	258	308
Multi-Engine Piston	18	20	22	26
Turboprop	0	3	5	9
Jet	0	1	3	5
Rotorcraft	2	3	4	5
Total Based Aircraft	234	265	292	353